The Description of the Line of Numbers, eleven times repeated, with two Radiusses in every Line, for the more convenience in the using thereof.

1. IT is an ordinary Line of Numbers, twice repeated in one Line, after the manner of a broken Line, beginning at 3, and ending at 3.

2. Every Line is the same as to number of Divisions, the uppermost five Lines having his small Divisions cut between two Lines only, with the fifth and tenth cuts drawn a little above the two Lines, and a Point set over every tenth, and three Points over every five tenth, for the better distinction sake.

And drawn so between two Lines, to gain room for the Money-Line, and Line of Days, from 1 Day to 5 Years.

The lower six Lines are cut between three Lines, as is usual for a Line of Numbers to be.

3. The Line of Money being Decimal Fractions of tenths of Farthings, of Farthings, of Pence, and Shillings, 1 *l.* starling, or 20 *s.* being the Integer, begins at one tenth of a Farthing, under 0000104 in the first Line, which is the proper Decimal Fraction of one tenth of a Farthing, and so proceeds to 1 *l.* under 1 at the right end of the fourth Line.

4. The

4. The Line of Time begins at 1 Day in the thir Line, and is contrived to give the Interest of 100 *l.* any number of Days, from one Day to 190 Days, fu half a Year, and consequently the Simple-Interest any other Sum at one operation.

Note, The Interest of a 100*l.* 10*l.* 1*l.* is seen fo any Days under 180, by Inspection only.

5. Note, That when this Paper print is well paste on a Board, it will admit of Brass Center-Pins, in 1 10, 100, 12, 112, 106, 17.15, 18.95, or any oth place to keep it from wearing out; and for the mo ready finding, and easie remembring of them, as t Multiplicators and Divisors in the Table, and in usi of them on the Lines, you must count the Point stan ing before the Cyphers as another Cypher added to t Multiplicators in the Tables.

6. Some Observations in the using of it in Numerati

Of all contrivances yet used, this is the plainest Numeration, every Line holding forth its proper valu from a ten-thousand part of an Integer, to 10 Millio of Integers.

As thus for instance:

In the middle part of the fifth Line are single Intege noted with 1, 2, 3, 4, 5, &c. then every longer strok or tenth, between Figure and Figure, are tenths of Integer, and the short cuts between the tenths, fro to 2.5, are tenths of a tenth, and from 2.5 to 5, e stroke is 2 tenths of a tenth, and from 5 to 10, eve cut is half a tenth, or 5 parts of one tenth.

Then for the ready counting of every tenth str between the Figures, observe this Rule in this fi Line, every longer stroke are tenths: as 2 and 5 ten

at the middle, between 2 and 3, noted with three Points over the ſtroke.

In the ſixth Line right under it is 25 Integers, for between 20 and 30 is 10 of thoſe longer ſtrokes, to repreſent 10 Integers, and the ſmall diviſions between, are ſingle tenths to 25, and then every two tenths to 50, and every five tenths to 100.

In the ſeventh Line, every long ſtroke with Figures at them, are 100 of Integers; then every tenth between, are 10 *s.* of Integers, and the ſmall ſtrokes between, are ſingle Integers, from 100 to 150, and every two Integers from 150 to 500, and every 5 Integers 500 to 1000.

In the eighth, every long ſtroke with Figures are 1000 *s.* every tenth between are 100 *s.* and the ſmall between, are tens to 1500, and twenties to 5000, and fifties of Integers from 5000 to 10000.

In the ninth Line, the long ſtrokes with Figures to them, are tens of thouſands; the ten next longer between, are thouſands; the ſhort cuts are hundreds, from 10 thouſand to 25 thouſand, and 200 from 25000 to 50000, and 500 parts from 50000 to 100·000.

In the tenth Line, the long ſtrokes are hundred thouſands, the next ten thouſands; the ſhort ones thouſands, two thouſands, and five thouſands.

In the eleventh and laſt Line, every long ſtoke with a Figure at it in the middle part, is a million, as 1, 2, 3, 4, 5, *&c.* millions; the next ſhorter are hundred thouſands, and the ſhorteſt are ten thouſands, from 1 million to 2 millions and a half, and 20 thouſands to 5 millions, and 50 thouſands to 10·000·000.

Which account is readily numbred by the number of Cyphers. As thus:

In the fifth Line are no Cyphers, therefore every tenth ſtroke between Figure and Figure, is but a tenth.

In the ſixth Line, where is one Cypher, they be unites, as 21, 22, 23, 24, 25, *&c.*

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In the ſixth Line, where is one Cypher, they be unites, as 21, 22, 23, 24, 25, *&c.*

In the ſeventh there are two Cyphers, and every tenth ſtroke between Figure and Figure is 10 *s.* as 210, 220, 230, &c.

And ſo in all the reſt, according to the number of Cyphers; as in the eleventh Line, every tenth is 100 thouſand.

On the contrary, from the fifth Line upward you muſt decreaſe as faſt.

For in the fifth Line, every Figure is a unite; in the fourth, but a tenth of an unite.

In the third Line, every ſtroke with a Figure at it is one hundred part of an unite, or Integer.

The ſecond Line, a thouſand part; and in the firſt Line, but one ten thouſand part of a unite, or Integer, and the intermediate Diviſions to tenths, and 100 parts of what the long ſtroke with a Figure is.

7. From hence you may obſerve, that more than Figures cannot well be read on this or any ordinary Line of Numbers, and what is more to be eſtimated as near as you may, and when need requires to be adjuſted by multiplying the laſt Figures by the Head or Per, as is ſhewed before in Multiplication.

8. *To find the Simple-Intereſt of any Sum by the Lines by Inſpection, or with Compaſſes.*

Example.

What is the Intereſt of 1 tenth of a Pound, *viz.* two Shillings, one Pound, 10 Pounds, 100 or a 100 Pounds, for any day under half a Year, by Inſpection?

Firſt, Seek the number of Days required among the Days, and juſt there in the Money-Line is the Simple Intereſt of 100 *l.* for that number of Days; in the Line right over it is the Intereſt of 10 *l.* and in the Line right under it the Intereſt of 1000; in two Lines

over it the Interest of 1 *l.* and in the third Line over it the Interest of 2 *s.* the same number of days.

			l.	*s.*	*d.*	*f.* 10.
	1000		11	10	0	0
Example. In 70 Days,	100		1	3	0	0
what Interest is due	10	*l.*	0	2	3	2.5
for	1		0	0	2	3
	01		0	0	0	1.1

Thus any Sum whatsoever may be parted, and so the Interest gained by Addition and Inspection only, as thus:

Suppose 125 *l.* were to have the Interest paid for 48 Days, what comes it to?

	l.	*s.*	*d.*	*f.*	10.
100 *l.* in 48 days demands	0	15	9	0	5
10 *l.* in like time demands		1	6	3	5
This set down two times and a half		1	6	3	5
For 25 *l.* the Sum added is		0	9	1	7
19 *s.* 8 *d.* Farthing 2 tenths,	0	19	8	1	2

the exact Interest due for 125 *l.* in 48 Days, at *6 per Cent. per Annum.*

Or sooner with Compasses, thus:

The extent from 100, to right over 48 Days in the Numbers, shall reach from 125 to 19 *s.* 30 parts; then if 1 *l.* is but 1, 19 *s.* is 095, and the Compass-Point reaches to 3 tenths more, to be expressed thus 003, which found in the third Line, just against it in the Money-Line, is 7 *d.* 2 Farthings, in all 0 *l.* 19 *s.* 7 *d.* 2 Farthings, the Interest due, being near as before.

Or, This Decimal Fraction may be set down just as the Line sheweth it, *viz.* 0.980, the 0 sheweth *0 l.* the 9 doubled is 18 *s.*, and the 5 more is 1 *s.*, *viz.* 19 *s.*; then the 3 over is near 3 tens of farthings, *viz.* 30 Farthings, which is 7 *d.* half-peny, the Sum near the former, as you may see in *Pag.* 15, also in *Pag.* 40 is more of this kind.

9. For the working of compound Interest by the Lines, I refer you to the Triangular Quadrant, or *Kersies Arithmetick* Pag. 322, *&c.* or in short thus for a few Years.

The exact extent from 100 to 106, being laid as many times as there be Years, the same way from the Sum propounded, shall stay at the Principal and Increase in so many Years.

Example.

What is the increase of 30 *l.* 10 *s.* in 5 Years compound Interest, at *6 per Cent*?

The extent from 100 to 106, being repeated 5 times for 5 Years, from 30 *l.*—50, for 30 *l.* 10 *s.* shall reach to 40 *l.* 16 *s.* 4 *d.* the Increase and Principal.

Or, If you turn the same extent of the Compasses 5 times the other way decreasing, it shall stay 22 *l.* 16 *s.* near the present worth of 30 *l.* 10 *s.* due 5 Year hence.

To perform this Work for many Years, Months, or Days, make use of this Table, and the Scale under the eleventh Line.

	Log. Days.	Log. Mont.	Log. Years.	
1	.00006928	.00210882	.02530586	1
2	.00013857	.00421764	.05061173	2
3	.00020786	.00632646	.05791759	3
4	.00027713	.00843528	.10122346	4
5	.00034642	.01054511	.12652932	5
6	.00041571	.01265293	.15183519	6
7	.00048498	.01476176	.17714105	7
8	.00055431	.01687057	.20244692	8
9	.00062360	.01897993	.22775279	9
10	.00069281	.02108822	.25305865	10
11	.00076215	.02319704	.27836452	11
12	.00083141	.02530586	.30367038	12

These Numbers are the Logarithms for 12 Days, 12 Months, and 12 Years, and by Addition, or by Multiplication, you may find the Logarithm of any time whatsoever.

Example.

What is the Increase or Rebate of 53 *l.* 5 *s.*, in 15 Years, 9 Months, and 17 Days?

In the foregoing Table

The Logarithm for 10 Years is	.25305865
The Logarithm for 5 Years is	.12652932
The Logarithm for 9 Months is	.01897993
The Logarithm for 10 Days is	.00069281
The Logarithm for 7 Days is	.00048498
The Sum of all these Logarithms is	.39974569

Then

Then this extent taken from the Scale of equal parts counting the first Figure 3 just under 800·000 in the eleventh Line; then for the first 9, connt 9 tenths of the first part before 1? then for the second 9, count by estimation 9 tenths of the last tenth more; then for the 7, that is to be clearly estimated, being in all very near 4 of the great parts.

This extent so taken between the Compasses, is the exact extent for 15 Years, 9 Months, and 17 Days on this Line of Numbers, and being laid from 53.25 for 53 *l.* 5 *s.* increasing, gives 133 *l.* 13 *s.* 3 or being laid the other way decreasing, gives 21 *l.* 4 *s.* 6 *d.* the present worth of 53 *l.* 5 *s.* due 15 Years, 9 Months, and 17 Days to come, at 6 *per Cent.* Compound-Interest.

10. For the increase of present worth of Annuities at 6 *per Cent.* First find what Sum of Money hath the Interest thereof, equal to the yearly Rent, half year or quarterly Rent, or Payment. Thus:

Suppose the Rent be 10 *l.* a Year. Say
As 6 to 100; so is 10 to 166 *l.* 666.

Then what shall the increase of 166 *l.* 666 be in Years?

The two Logarithms of 10 Years, and 11 Years added, is .53142317, and being taken from equal parts, and laid increasing from 166.66, gives 566 66 from which Sum when 166.666 the first principal subtracted, remains 400 *l.* for the Increase, or Rent due to be paid at the end of 21 Years, having received none all that time.

11. And the same extent laid decreasing from 400 shall reach to 117 *l.* 12 *s.* the ready Money that shall purchase a Lease of 10 *l.* a Year, to continue 21 Years and pay no yearly Rent.

12.

12. In using these Lines, always set the points of the Compasses in that Line of the three Marginal-lines, (between which the tenths are cut) that the Brass-Center-Pins are put in, which is always the lower-most (or the middle) Line; for, else when you measure across, you can have no true answer.

13. In finding the Square-Root of a Number when the Figures be odd, the left hand 1 is the unite, and when they be even, the right hand 1 is the unite, or else you cannot divide the space between the number and 1 into two equal parts, when you measure across the Lines.

14. 1. In finding the Cube-Root of a Number when the Point falls on the last Figure, the left hand 1 is unite.

2. When it falls on the last but 2, then the right hand 1 is unite.

3. But when it falls on the last but 1, then any of the ones, either the right or left may be unite; but in turning the Compasses three times, you will pass by one of the unites, or else you cannot divide the space between 1 and the number given into three equal parts, as it must be in this operation, according to one general rule, and the first of three repeatings from 1, is the Cube-Root required.

Therefore in this case, if your Number be in the right end, the left hand 1 is the unite; but if your Number be in the left end, then the right hand 1 is the unite.

Example of the three Rules:

1. To find the Cube-Root of 1953125, where the Point falls on the last Figure, the unite will be on the left hand of the Number.

For

For one third part of the extent, between 1 in th fifth Line, and 1953125 in the eleventh Line, will fa exactly on 125 in the seventh Line, which number 12 is the exact Cube-Root.

2. When the Point falls on the last Figure but two as in 941192, or 571787, then the unite will lie on th right hand of the Number.

Thus the exact third part between 1 on the right en in the fourth Line, and 941192 in the tenth Line, wi be at 98 in the sixth Line.

Or more apparently: The exact third part betwee 1 in the fourth Line, and 571787 in the tenth Lin will be at 83 in the sixth Line, one Line being betwee every extent of the Compasses, which could not be you went from this number in the tenth Line towa the other 1 at the left end.

But note, that you may work it by counting th 571787 in the beginning of the eleventh Line, and th unite of the fifth Line, for there also is six Lines betwe the number and 1, to be parted into three equal part yet the unite lies on the right hand of the Number he also, as it did before.

The like may happen in the first way also, when th Number falls between 1 million and 3 millions; or a first Figure of a Number, being between 1 and where the Rule is the same, the Unite being on the le hand of the Number propounded.

3. But when the Point falls on the last Figure b one, then the first Figure between 3 and 9, the rig hand 1 is the unite, and the left hand unite lies betwe the Number and it.

But when the first Figure of the Number propounde is less than 3, you must count or find it at the rig end of the Lines, and the left hand 1 is the unite, a the right hand 1 is between the Number and it.

Exam

Example both ways.

If this Number 28372625 be propounded to find the Cube-Root of it, this Number is found in the eleventh Line at the right end, and the exact third part between the left hand 1 the Number, is at 305 in the seventh Line.

Again, If 62431 were given to find the Cube-Root of, it would be found at the left end of the tenth Line, and then the unite must be at the right end, on the fourth Line; for, otherwise you cannot divide the space between into three equal parts, as the general Rule is.

Thus the exact third part, between 1 in the fourth Line, and 62431 in the tenth Line, is at 39.7, the Cube-Root required.

Note always, that the first of the three parts, counting from 1, is the Cube-Root.

Thus I have been over large to make this matter plain to any capacity.

Some Examples in the Rule of Three, and Practice, by these Lines.

1. *If* 1 *cost* 3 *l.* 10 *s*, *what cost* 112?

The extent from 1 in the fifth Line, to 3.5, for 3 *l.* 10 in the same Line, shall reach the same way from 112 in the seventh Line, to 39 *l.* and 0163 more, which 0163, sought on the fourth Line of Numbers, in the Money Line, just under it is 3 *s.* 3 *d.* the near answer, being in all 93 *l.* 3 *s.* 3 *d.*

2. *If* 112 *l. cost* 4 *l.* 10 *s*, *what cost* 1?

The extent from 112 in the seventh Line, to 4 *l.* 10 *s.* in the fifth Line, shall reach the same way from 1 in the fifth Line, to 9 Pence, half-Peny, and half-farthing, and better in the third Line.

3. *If*

For one third part of the extent, between 1 in the fifth Line, and 1953125 in the eleventh Line, will fall exactly on 125 in the seventh Line, which number 125 is the exact Cube-Root.

2. When the Point falls on the last Figure but two as in 941192, or 571787, then the unite will lie on the right hand of the Number.

Thus the exact third part between 1 on the right end in the fourth Line, and 941192 in the tenth Line, will be at 98 in the sixth Line.

Or more apparently: The exact third part between 1 in the fourth Line, and 571787 in the tenth Line will be at 83 in the sixth Line, one Line being between every extent of the Compasses, which could not be if you went from this number in the tenth Line toward the other 1 at the left end.

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3. But when the Point falls on the last Figure but one, then the first Figure between 3 and 9, the right hand 1 is the unite, and the left hand unite lies between the Number and it.

But when the first Figure of the Number propounded is less than 3, you must count or find it at the right end of the Lines, and the left hand 1 is the unite, and the right hand 1 is between the Number and it.

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The extent from 112 in the seventh Line, to 4 *l.* 10 *s.* in the fifth Line, shall reach the same way from in the fifth Line, to 9 Pence, half-Peny, and half-farthing, and better in the third Line.

3. *If*

3. *If* 3 *Yards and* 3 *Quarters of Riboning cos* *Pence* 2 *Farthings, what ſhall* 17 *Yards and a Quar* *coſt* ?

The extent from 3.75 in the fifth Line, to 9 Pe 2 Farthings in the fourth Line, ſhall reach the fa way from 17.25 in the fifth Line, to 3 *s.* and 8 *d.* fourth Line, the anſwer to the Queſtion.

Where you may always obſerve, that the ſame ex you take from the firſt Number to the ſecond, count the Lines between, the ſame extent counted the ſa way, and the ſame number of Lines, muſt be betw the third and the fourth Number, in all operati whatſoever.

FINIS.
